lines 23-27, the examples on pages 12-18 and in Table 2 on page 15 and Table 4 on page 17. The claims as amended now require treatment with both a protein degrading agent and a starch degrading agent.

CLAIM REJECTION -35 USC § 102

Claims 1, 4, 9-10 and 19 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 3,163,549 to Vollink et al., which teaches a process for preparing an adhesive by "commingling fine mesh flour with a substantially proteolytic enzyme in an aqueous medium" (col. 2, lines 35-37). Vollink et al. disclose that the "proteolytic activity of the enzyme decompos[es] a substantial portion of the protein in the flour" (col. 2, lines 47-49) and that "the enzyme used must be one which will attack the protein of the particular flour present" (col. 3, lines 34-35). However, Vollink et al. also teach that **"a breakdown of the starch fraction of the flour is undesirable because it mitigates the adhesive characteristics of the adhesive blend"** and it is desirable that "the enzyme or enzymes present have as little amylolytic activity as possible" (col. 3, lines 41-45).

The claims of the present application have been amended so that they require the flour to be treated with "a chemical and/or enzymatic starch chain-degrading agent" (specification, page 6, lines 26-28), such as APS, amylases or combinations thereof (page 6, lines 29-36). The present invention requires the degradation of both the protein component and the starch component of the flour, while Vollink et al. teach a breakdown of the protein component alone. The use of APS or amylase as a starch chain-degrading agent is neither taught nor suggested by Vollink et al. Instead, Vollink et al.

teach that **"a breakdown of the starch fraction of the flour is undesirable"** and that the **"enzymes present should have as little amylolytic [starch modifying] activity as possible"** (col. 3, lines 41-45). Thus, Vollink et al. teach away from the present invention and one skilled in the art would not use a starch chain-degrading agent to treat flour based on the teachings of Vollink et al. because Vollink et al. teach that such agents adversely affect the adhesive characteristics of the material. Therefore, the starch and protein containing material of the present invention is not anticipated by Vollink et al., nor is the present invention obvious in view of Vollink et al., because Vollink et al. teach that it is undesirable to use a starch chain-degrading agent.

CLAIM REJECTION -35 USC § 103

Claims 1, 4, 9-10 and 19 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 2,466,172 to Kesler et al. in view of U.S. Pat. No. 4,940,514 to Stange et al. The applicants respectfully submit that it is not obvious to combine Kesler et al. with Stange et al. and that Kesler et al. teach away from any such combination.

Kesler et al. teach a method of preparing an adhesive from cereal flour "in which the starch of the flour is gelatinized but remains substantially unmodified" (col. 1, lines 12-15). The method includes "the addition of alkali to the flour prior to the gelatinization" (col. 3, lines 11-12), wherein "the starch is modified and the viscosity decreased without forming any substantial proportion of reducing sugars in the mixture" (col. 4, line 73 to col. 5, line 1). The table at col. 5, lines 32-42 lists data for adhesives prepared in accordance with the Kesler et al. method (samples 2 and 3). The data

shows that the adhesives prepared using the Kesler et al. method have a viscosity of **9,000 centipoise**.

In contrast to the adhesives taught by Kesler et al., the adhesive materials of the present invention are modified using protein and starch degrading agents which reduce the viscosity. The data in Table 2 on page 15 and Table 4 on page 17 of the present application show that the viscosities for materials prepared in accordance with the present invention are below **100 centipoise**. The dramatic difference in the viscosities between the Kesler et al. adhesives and the present invention clearly shows that Kesler et al. modify the flour to a limited extent (see col. 2, lines 48-50) and that their process does not significantly degrade the starch component of the flour as required by the present invention.

It is well known to those skilled in the art that amylases convert starch to sugar (see the discussion of Vollink et al. above). Kesler et al. neither teach nor suggest the use of amylase because the adhesives formed by their method "contain[] a minimum quantity of reducing sugars" (col. 1, lines 25-26). It is implicit from the Kesler et al. disclosure that their adhesives do not contain amylase because they disclose that "the quantity of reducing sugars in the adhesive product is limited by limiting the modification of the starch" (col. 2, lines 48-50). The addition of amylase to Kesler et al.'s adhesives would increase the quantities of sugar and would be directly contrary to their teachings. Therefore, combining Kesler et al. with Stange et al. (which teaches the use of amylase) would not be obvious to one skilled in the art because Kesler et al. teach away from increasing the quantities of sugar in their adhesives.

The present invention is not obvious based on Kesler et al. in view of Stange et al. because the adhesives taught by Kesler et al. are substantially different than the present invention in that the starch component of the flour is not substantially degraded as shown by the high viscosity of the adhesive (9,000 centipoise as compared to less than 100 centipoise for the present invention). Furthermore, using amylase to digest starch and reduce the viscosity of the adhesives would lead to the formation of a substantial quantity of sugars and would be contrary to the teachings of Kesler et al., which require "control of the modification of the starch [so that] the quantity of reducing sugars present in the product is also minimized" (col. 5, lines 66-68). The addition of a sufficient amount of amylase to reduce the viscosity from 9,000 centipoise to less than 100 centipoise would significantly increase the amount of sugar in the adhesive and change the characteristics of the adhesives.

CLAIM REJECTION -35 USC § 103

Claims 2 and 3 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. or Kesler et al. Both Vollink et al. and Kesler et al. teach away from the present invention because both references teach that the amount of sugar in the adhesives should be held to a minimum. As discussed above, Vollink et al. teach that the amylolytic activity (which reduces starches to sugars) should be kept to a minimum (col. 3, lines 42-45) and Kesler et al. teach that the quantity of reducing sugars in the adhesive product is limited by limiting the modification of the starch (col. 2, lines 48-50). Therefore, Vollink et al. and Kesler et al. neither teach nor suggest the

present invention, and it would not be obvious to one skilled in the art to treat flour with amylase or another starch degrading agent which would produce substantial quantities of sugar in the adhesive product. Instead, Vollink et al. and Kesler et al. teach away from the present invention because they would discourage one skilled in the art from using amylase to modify the starch component of the flour.

CLAIM REJECTION -35 USC § 103

Claim 7 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. or Kesler et al. in view of U.S. Pat. No. 2,559,901 to Scheid. As discussed above, Vollink et al. and Kesler et al. teach away from the present invention because they discourage the use of a starch degrading agent such as amylase which would increase the quantity of sugars in the adhesive product. Scheid teaches a process which reduces flour to simple sugar by reacting soy flour with amyliq enzyme (col. 3, lines 35-50). Both Vollink et al. and Kesler et al. teach that it is undesirable to convert the starch into sugar and, therefore, these references teach away from Scheid. Therefore, the present invention is not obvious by a combination of Vollink et al. or Kesler et al. with Scheid because one skilled in the art would not combine Vollink et al. and Kesler et al. with Scheid.

CLAIM REJECTION -35 USC § 103

Claims 5, 6 and 14 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. or Kesler et al. in view of Applicants' Admitted Prior Art. As discussed above, both

Vollink et al. and Kesler et al. teach away from the use of a starch degrading agent such as amylase, which converts the starch component in the flour to sugar. Therefore, while it may have been known to reduce the viscosity of the flour mixture so that a size press could be used, it would not have been obvious to use amylase in the adhesives taught by Vollink et al. and Kesler et al. because both references teach away from using a starch degrading agent in their adhesives.

CLAIM REJECTION -35 USC § 103

Claim 8 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. or Kesler et al. in view of European Patent Application No. 554,659 to Schober, which discloses a paper object that includes a cellulose component and a vegetable component, but it does not teach, nor suggest, the use of a starch degrading agents. As discussed above, both Vollink et al. and Kesler et al. teach away from the use of a starch degrading agent such as amylase, which converts the starch component in flour to sugar. Because it would not have been obvious from either Vollink et al. or Kesler et al. to use amylase or some other starch degrading agent, the combination of these two references with Schober does not make the present invention obvious. Neither Vollink et al., Kesler et al. nor Schober teach or suggest the use of an agent for the degradation of the starch component of flour.

CLAIM REJECTION -35 USC § 103

Claims 12 and 17 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. and Kesler et al. in view of U.S. Pat. No. 3,211,564 to Lauterbach, which teaches that APS is used as an oxidizing agent for modifying raw starch and changing the viscosity (col. 3, lines 10-11 and col. 4, lines 21-25).

Vollink et al. teach that **"a breakdown of the starch fraction of the flour is undesirable"** (col. 3, lines 41-42). There would be no reason for one skilled in the art to add APS (or any other oxidizing agent which breaks down starch) to the adhesive taught by Vollink et al. because Vollink et al. explicitly teach that "a breakdown of the starch fraction is undesirable." Therefore, Vollink et al. teach away from adding APS to their adhesive and it would not be obvious to combine Vollink et al. with Lauterbach.

Furthermore, Lauterbach discloses that the preferred temperatures for using oxidizing agents for modifying starch are between 220°F and 350°F, **well above the 120°F to 175°F gelatinization range of most starches** (col. 3, lines 42-51). In contrast, **Vollink requires the temperature to be maintained below 150°F** so that gelatinization of the starch will not occur ("[I]t has been found to be **requisite that the temperature of the flour not be allowed to exceed about 150°F.**, so that gelatinization of the starch will not occur." col. 3, lines 27-30). Lauterbach teaches the use of APS as an oxidizing agent at temperatures above the gelatinization temperature of the starch and Vollink et al. require the operating temperatures be kept below the gelatinization temperature of the starch. Therefore, Vollink et al. teach away from using APS at the temperatures taught by Lauterbach and

one skilled in the art would not use the starch degrading agents taught by Lauterbach in the Vollink et al. process.

Claims 12 and 17 of the present application are not obvious from Kesler et al. in view of Lauterbach because these claims require the addition of both protease and APS to flour. Neither Kesler et al. nor Lauterbach teach the use of protease to degrade flour. Therefore, the combination of Kesler et al. and Lauterbach would not make Claims 12 and 17 obvious. Moreover, Kesler et al. teach that their process can use a hydrolyzing enzyme to modify the starch (col. 4, lines 70-75). There is no teaching nor suggestion in either Kesler et al. or Lauterbach that substituting an oxidizing agent, such as APS, for a hydrolyzing enzyme would produce the same results. Hydrolysis and oxidation are two different chemical reactions and neither Kesler et al. nor Lauterbach teach or suggest that the two reactions would produce the same results. Moreover, there is no teaching or suggestion that the use of an oxidizing agent in the Kesler et al. process would produce an acceptable adhesive material. Tests would have to be conducted in order to determine if an oxidizing agent could be used in the Kesler et al. process and, therefore, the combination of Kesler et al. and Lauterbach would not be obvious to one skilled in the art.

CLAIM REJECTION -35 USC § 103

Claims 13 and 18 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. and Kesler et al. in view of Stange et al. Stange et al. teach the use of amylases to modify starch. As discussed above, both Vollink et al. and Kesler et al. teach away from using a

starch degrading agent in their adhesives. Vollink et al. explicitly require that "the enzyme or enzymes present have as little amylolytic activity as possible" (col. 3, lines 44-45) and Kesler et al. teach that enzymes that convert starch to sugar are "purposely avoided" (col. 1, lines 32-41). Therefore, one skilled in the art would not use amylase in either the Vollink et al. process or the Kesler et al. process because both references explicitly state that enzymes, such as amylase, form undesirable sugars which would adversely affect the adhesive characteristics.

CLAIM REJECTION -35 USC § 103

Claim 20 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Vollink et al. As discussed above, both Vollink et al. teach away from using a starch degrading agent in their adhesives. Vollink et al. teach that **"a breakdown of the starch fraction of the flour is undesirable"** (col. 3, lines 41-42). Claim 20 includes a degrading agent which modifies the starch by breaking it down. Therefore, Claim 20 contradicts the teachings of Vollink et al. and would not be obvious to one skilled in the art.

CONCLUSION

As a result of the amendments to the claims, Applicants submit that the claims are now in proper form and distinguishable from the prior art cited in the May 25, 1999 Office Action. Therefore, Applicants respectfully request early allowance of the claims.

Respectfully submitted,

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